Translocation of the Yabby *Cherax destructor* into eastern drainages of New South Wales, Australia

Jason Coughran[1], Robert B. McCormack[1,*], Garry Daly[2]

[1]Australian Aquatic Biological Pty Ltd, PO Box 3, Karuah, NSW, 2324

[2]Gaia Research Pty Ltd, PO Box 3109, North Nowra, NSW, 2541

*Author to address correspondence: info@aabio.com.au

ABSTRACT

The Yabby *Cherax destructor* has a natural distribution across inland river systems in central and south-eastern Australia. Within that range it supports important recreational and commercial fisheries, and is also widely used for aquaculture and as a pet in the aquarium trade. Recently, the species has become established in parts of Australia outside its natural range. This paper documents sites of translocation in the coastal drainages of eastern New South Wales, Australia. Potential implications of these translocations are discussed with regard to the native aquatic fauna of the region. We draw particular attention to: (i) the native species of amphibian that are threatened by predation by introduced yabbies, and (ii) the native crayfish fauna threatened by competition with this species. The Fitzroy Falls Crayfish *Euastacus dharawalus* has a distribution restricted to one small catchment and *C. destructor* has been recently translocated into this creek. On the basis of these data, we propose to nominate *C. destructor* as a key threatening process under the *Threatened Species Conservation Act 1995* and *Euastacus dharawalus* as a threatened species, also under that Act.

Key words: amphibian, crayfish, *Cherax destructor, Euastacus dharawalus,* translocation, threatening process, Yabbie, Yabby.

Introduction

The Yabby *Cherax destructor* is the most widely distributed of the 130 odd species of crayfish in Australia, with a natural distribution in the States of New South Wales (NSW), Queensland, Victoria, South Australia, the Northern Territory and the Australian Capital Territory (Sokol 1988; Figure 1). *Cherax destructor* has also been introduced into Western Australia and Tasmania (Austin 1985; Elvey *et al.* 1996; Horwitz 1990; Horwitz and Knott 1995). However, this yabby's natural distribution is confined to river systems west of the Great Dividing Range (Sokol 1988). Although naturally restricted to the inland river systems, *C. destructor* thrives in a wide range of water bodies and are well known for their broad environmental tolerance and capacity to proliferate in high densities (McCormack 2008).

Yabbies, and in particular *C. destructor*, are commercially grown for a number of purposes: as food for human consumption; as food for native animals (e.g. in zoos, reptile parks); as aquarium species and as food for other aquarium species; as bait for recreational fishermen; and as stock for people to seed their farm dams and ponds as a food source. It is likely that both deliberate and accidental translocations of *C. destructor* have resulted in several populations becoming established in the eastern drainages of NSW. Surveys in this State have recorded a number of sites where the species has colonised, including catchments of the Macleay, Macquarie-Tuggerah Lakes, Hunter, Hawkesbury, Georges, Shoalhaven, Clyde and Tuross river systems (**Figure 1, Table 1**).

Potential impacts

The impacts of translocated populations of *C. destructor* in other areas of Australia have been discussed by Austin (1985); Bradsell *et al.* (2002); Elvey *et al.* (1996); Horwitz (1990); Horwitz and Knott (1995); Merrick (1995). These impacts are also relevant to the coastal region of NSW. In addition to its broad environmental tolerance, *C. destructor* displays a rapid growth rate, attaining maturity in as little as 4 months, and after maturing females devote most of their energy into reproduction (Figure 2; Wingfield 2002). Repetitive spawning is common, and females may brood up to three times in a breeding season (Rankin 2000; Wingfield 2002). In contrast, most of the crayfishes native to coastal NSW are slow-growing species that take several years to attain maturity (Merrick 1995; Morgan 1997; Turvey and Merrick 1997a,b; Coughran 2006; McCormack 2008). These data suggest that the aquatic ecosystems of coastal NSW may be adversely impacted by this exotic and prolific invader. We provide two examples that indicate that impacts due to predation and competition may already be occurring.

Example 1 – the endemic frog fauna (predation)

Cherax destructor was detected in the upper catchment of Yerriyong Gully, south of Nowra on the south coast of NSW in 2006. A gully in the upper catchment had been dammed and this waterbody and approximately 250 m of the creek below were surveyed at night with the aid of a spotlight. The section of the creek surveyed supported a high density

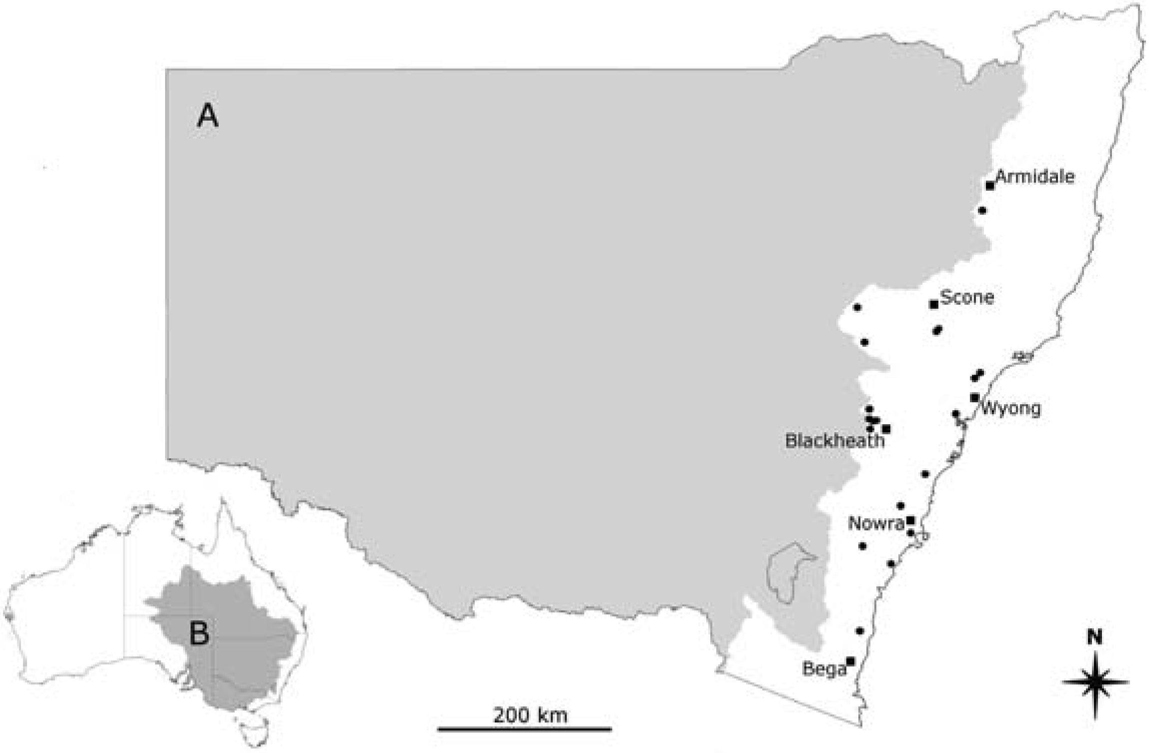


Figure 1. (A) Records of translocation for the Yabby, *Cherax destructor,* in coastal drainages of eastern New South Wales (black circles). The natural distribution of the species in New South Wales is confined to river systems west of the Great Dividing Range (grey shading). (B) inset showing the entire natural distribution of the species (grey shading). *Natural distribution derived from Sokol* (1988).

Table 1. Locality details for the records of translocation for the Yabby, *Cherax destructor*, in eastern New South Wales. **registration code of voucher material retained (where applicable), as part of the Australian Crayfish Project.*

Date of capture	Longitude	Latitude	Site details	Catchment	Altitude (m)	ACP voucher codes*
27/12/2007	151.5437	-30.8223	Frizzy Ck, Uralla Rd crossing, north of Walcha	Macleay	1000	952-957
27/12/2008	151.5159	-32.9209	Forest dam, Heaton SF, near Mount Sugarloaf	Macquarie-Tuggerah Lakes	400	1646-1649
10/01/2005	150.9514	-32.3441	Un-named creek into Lake Liddell, Singleton	Hunter	150	n/a
10/10/2005	150.9895	-32.3542	Lake Liddel, Singleton	Hunter	145	n/a
5/07/2007	151.0147	-32.1043	Lake Glenbawn, eastern shores	Hunter	300	n/a
28/11/2008	151.4456	-32.9936	Dam side road, Heaton Lookout Rd & Watagan Rd, Watagans	Hunter	520	1588-1590
19/04/2008	150.0784	-33.3948	Wangcol Ck, Brays Lane crossing, Lithgow	Hawkesbury	890	1144-1145
6/12/2008	151.1943	-33.4554	Calvetts Ck, old Pacific Hwy crossing, Mount White	Hawkesbury	170	1642-1644
11/02/2009	150.1673	-33.5413	Boxes Ck, Blackmans Ck Rd crossing, Hartley	Hawkesbury	725	1849-1853
11/02/2009	150.0899	-33.6521	Gangenang Ck, Marsden Swamp Rd crossing	Hawkesbury	690	1856-1857
11/02/2009	150.1242	-33.5499	Coxs River, McKanes Fall Rd crossing (under McKanes Bridge)	Hawkesbury	730	1866-1867
11/02/2009	150.0782	-33.5241	Lake Lyell, at launching ramp, Lithgow	Hawkesbury	790	1868-1869
21/02/2009	150.0744	-33.4140	Lake Wallace, at lake shore end road in park, near Wallerawang	Hawkesbury	880	1877-1879
19/02/2008	150.8445	-34.2333	Stokes Ck, Dharawal SCA	Georges	350	n/a
5/03/2007	150.4830	-34.6446	Yarrunga Ck, last picnic area above Fitzroy Falls, Morton NP	Shoalhaven	700	642-643, 647
26/09/2006	150.4840	-34.6451	Yarrunga Creek, above Fitzroy falls, Morton NP	Shoalhaven	700	411, 444
09/09/2008	150.6000	-34.9667	Parma Creek, above falls, south of Nowra	Clyde	20	n/a
2007	150.3500	-35.3667	Farm dam, Jindalara Creek Road, west of Ulladulla	Clyde	70	n/a
5/03/2007	149.9917	-35.1667	Grassy Ck, Oatley Road crossing, edge of Morton NP	Shoalhaven	550	633-636
2/06/2007	149.9563	-36.2639	Reedy Ck, Tin Pot Rd, Bodalla SF	Tuross	250	772

of *C. destructor*. In pools measuring approximately 6 x 6 x 0.4 m deep hundreds of individuals varying in size from 10 - 150 mm were observed. No frogs or tadpoles were detected during a brief survey of the dam and tadpoles of the Striped Marsh Frog *Limnodynastes peroni* were observed in an isolated pool beside the creek that did not contain any yabbies (Figure 3). Further investigations indicated that *C. destructor* had colonised approximately 5 km of creek downstream and subsequently ten km upstream of the adjoining Parma Creek. No facultative lotic (stream) breeding species of amphibian such as the Blue Mountains Tree Frog *Litoria citropa*, Lesueur's Frog *L. lesueuri* or Green Stream Frog *L. nudidigata* were detected at sites supporting high densities of *C. destructor*, yet these species were common in similar habitat at sites where the Yabby was absent or in low densities (Daly and Craven 2007). In another example, *C. destructor* was liberated into a farm dam in the Clyde River catchment, south of Nowra in 1997. Prior to the liberation, the dam supported Peron's Tree Frog *L. peroni* and Haswell's Toadlet *Paracrinia haswelli*. Calling frogs were common on the edge of the dam and tadpoles were observed in the water. Currently, neither species call from the edge of the dam and no tadpoles have been observed in the dam, which supports a high density of *C. destructor*.

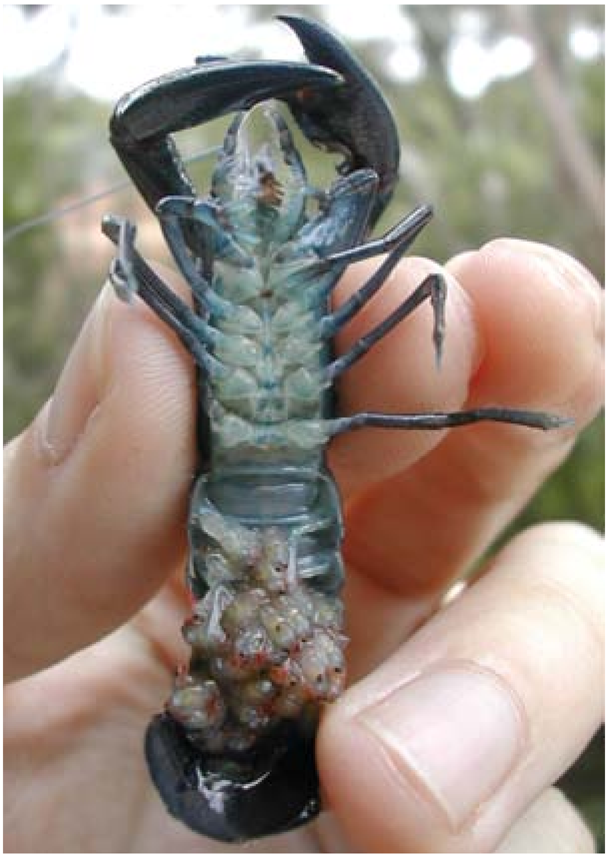


Figure 2. The Yabby *Cherax destructor* is adapted to rapidly exploit favourable conditions. Mature females devote most of their energy to reproduction and can reach maturity in as little as four months. This captive female measures only 21.5 mm OCL and carries her first clutch of juveniles. Female *C. destructor* can spawn several times in each breeding season, and at larger sizes typically carry 300-400 eggs, and as many as 960 eggs, in each clutch (Lake and Sokol 1986).

Example 2 – the endemic crayfish fauna (competition)

The Dharawal or Fitzroy Falls Crayfish *Euastacus dharawalus* (Figure 4) has an extremely restricted distribution confined to streams above Fitzroy Falls, near Moss Vale on the southern highlands of NSW. Recently, the site has become populated with *C. destructor*. The translocated population was first detected in 2006, and since then the number of *C. destructor* detected by diurnal surveys, combined with trapping and stringlines, has increased. These surveys at Fitzroy Falls have been targeted to the collection of 2-3 *E. dharawalus* specimens, and all involved a similar effort (approximately 60 minutes of baiting). The number of *C. destructor* incidentally collected during these surveys has been increasing with each survey, undertaken in September 2006 (3 yabbies), March 2007 (12 yabbies) and January 2008 (73 yabbies). In the 2008 survey it was also observed that all of the *E. dharawalus* specimens were bearing injuries consistent with competitive interactions (i.e. missing limbs). We suggest that the reproductive traits of *C. destructor* equip it to out-compete the endemic *E. dharawalus*.

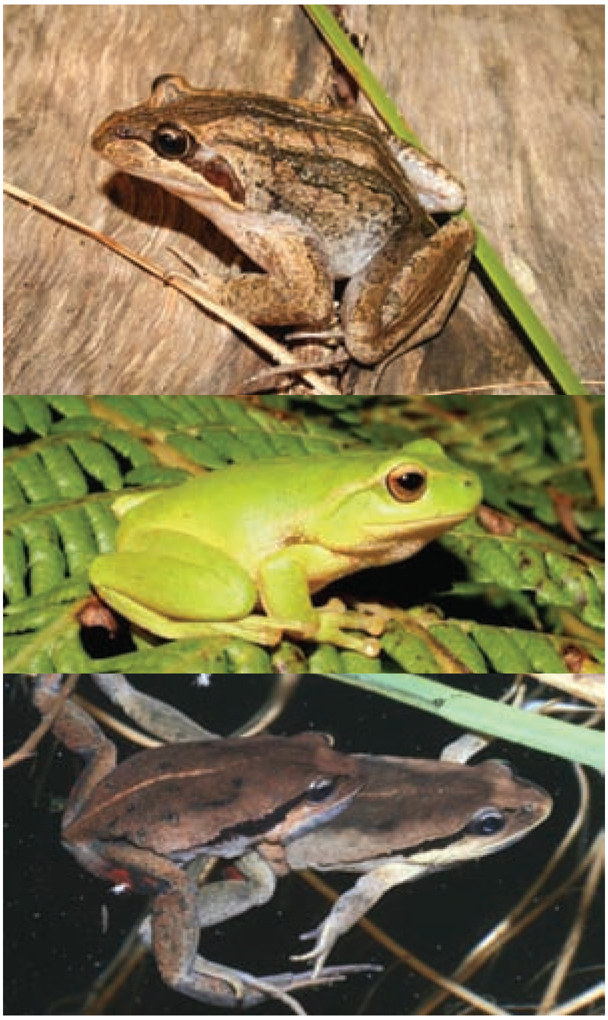
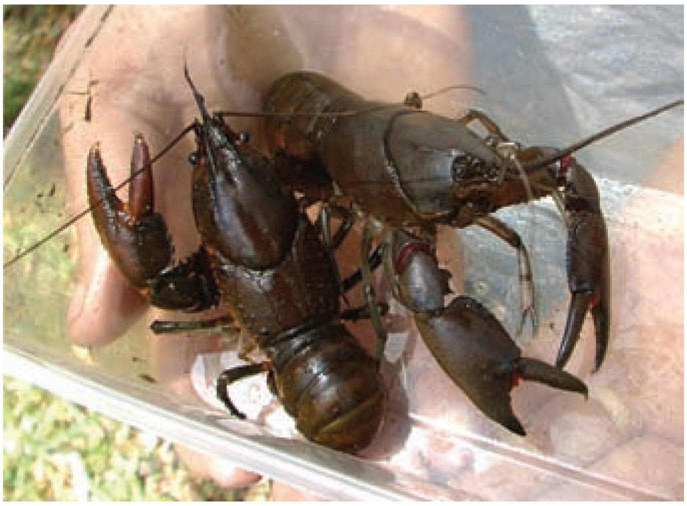


Figure 3. Recent surveys in the Clyde River catchment indicate that several species of frog are absent from sites where the introduced *Cherax destructor* occurs in high density, including (top to bottom): *Limnodynastes peroni*, *Litoria nudidigita* and *Paracrinia haswelli*. Frogs are still commonly found at similar, nearby sites that have not been invaded by *C. destructor*, or where it is present in low densities.



Summary and Recommendations

These examples indicate that C. *destructor* can colonise coastal streams and dams in NSW to the detriment of amphibians and crayfish. Mortality associated with predation of frog eggs and tadpoles from C. *destructor* is considered a threatening process, as is the competition between this invader and the late-maturing native crayfishes. We propose to nominate C. *destructor* for inclusion as a key threatening process in Schedule 3 of the *Threatened Species Conservation Act 1995* in New South Wales. If this is accepted, then C. *destructor* will be the first native invertebrate to be included in this schedule. Research should be initiated immediately into the scale of impacts associated with the introduced Yabby.

Figure 4. In the absence of any information or identification guides, recreational fishers may not be able to distinguish between the imperilled Fitzroy Falls Crayfish *Euastacus dharawalus* (left) and the exotic *Cherax destructor* (right). A general lack of awareness of the astounding biodiversity of crayfish in eastern New South Wales is an impediment to the successful conservation of this fauna, particularly in the face of looming threats from introduced species and exploitation.

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